IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicants:	T. Yamaguchi et al.	Attorney Docket No.: NAII123496
Application No.:	10/506720	Art Unit: 1795 / Confirmation No.: 5176
Filed:	March 10, 2005	Examiner: Jane J. Rhee
Title:	ELECTROLYTE FILM AND SOLID POLYMER FUEL CELL USING THE SAME	

APPELLANTS' APPEAL BRIEF

Seattle, Washington
March 19, 2010

TO THE COMMISSIONER FOR PATENTS:

This Brief is in support of a Notice of Appeal filed in the above-identified patent application on December 21, 2009, to the Board of Patent Appeals, appealing the decision of August 26, 2009, finally rejecting Claims 1-10.

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I. REAL PARTY IN INTEREST

The real party in interests in the above-identified application is the Nitto Denko Corporation, a Japanese corporation, having a principal place of business at 1-2, Shimohozumi 1-Chome, Ibaraki-shi, Osaka, Japan. Assignment of the present application and the invention from the inventors to the real party in interest was recorded at Reel 015762, Frame 0851.

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II. RELATED APPEALS AND INTERFERENCES

None.

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III. STATUS OF CLAIMS

An Examiner's Action was mailed on August 26, 2009, finally rejecting Claims 1-10. A Notice of Appeal was filed, appealing the final rejection of Claims 1-10, on December 21, 2009. The status of each claim on appeal is presented below.

A copy of the claims presented on appeal is attached in section VIII. CLAIMS APPENDIX.

1. Finally rejected.
2. Finally rejected.
3. Finally rejected.
4. Finally rejected.
5. Finally rejected.
6. Finally rejected.
7. Finally rejected.
8. Finally rejected.
9. Finally rejected.
10. Finally rejected.

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IV. STATUS OF AMENDMENTS

Claims 1-10 are pending in the application. Claims 1-10 were presented for examination by the Preliminary Amendment, filed September 7, 2004. Claim 1 was amended with the Amendment filed on January 19, 2007, to recite that the electrolyte membrane includes a first polymer having proton conductivity that imparts proton conductivity to the electrolyte membrane. Claims 1-10 were finally rejected in the Office Action of March 28, 2007. An RCE was filed on August 27, 2007, wherein Claim 1 was amended to recite that the third polymer of the electrolyte membrane includes a carbon-carbon double bond. Claims 1-10 were again finally rejected on April 24, 2008. An RCE was filed on October 24, 2008, wherein no claims were amended. Claims 1-10 were amended with the response filed April 23, 2009, so as to recite that the electrolyte membrane has a proton conductivity of 0.05 S/cm or more and a membrane area change ratio of 20% or less. Claims 1-10 were again finally rejected on August 26, 2009.

No amendments subsequent to the final rejection dated August 26, 2009, have been filed, and there are no outstanding amendments to the application.

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V. SUMMARY OF CLAIMED SUBJECT MATTER

Claims 1-10 are pending. Claim 1 is the sole independent claim. Claim 1 recites an electrolyte membrane (¶ [0010]) comprising a porous substrate (¶¶ [0045]-[0047]), wherein pores of the porous substrate are filled with a first polymer having proton conductivity (¶ [0050]), thereby to impart proton conductivity to said electrolyte membrane, and the porous substrate is comprised of i) a second polymer which is at least one selected from the group of polyolefins (¶¶ [0032]-[0033]), and ii) a third polymer having a carbon-carbon double bond in the molecule of the third polymer (¶ [0038]), and the porous substrate comprises a crosslinked second polymer wherein the second polymers are crosslinked with one another, and wherein the electrolyte membrane has a proton conductivity of 0.05 S/cm (FIGURE 1, data series B-3) or more and a membrane area change ratio of 20% or less (FIGURE 1, data series B-3).

Identification of where the claimed subject matter is described in the specification will now be provided. Because the original application was filed without line number notations, the citations to the specification reproduced below (and any citations in the Argument section) will refer to the paragraphs of the published application (U.S. Publication No. US 2005/0147860 A1).

Support for Claim 1 can be found in paragraph 10, with the exception of the final "wherein" clause reciting the proton conductivity and membrane area change ratio of the electrolyte membrane.

Support for the specific characteristics of the proton conductivity (0.05 S/cm or more) and the membrane area change ratio (20% or less) of the electrolyte membrane can be found in FIGURE 1, data series B-3.

Support for the substrate being a porous substrate can be found at paragraphs 45-47.

Support for the first polymer having proton conductivity can be found at paragraph 50.

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Support for the proton conductivity of the substrate depending on the first polymer characteristics can be found at paragraph 55.

Support for the second polymer being a polyolefin can be found at paragraphs 32-33.

Support for the second polymer being crosslinked with itself can be found at paragraph 34.

Support for the third polymer having a carbon-carbon double bond can be found at paragraph 38.

Support for the general concept of the membrane area change ratio, as recited in Claim 1, can be found at paragraph 48.

Claims 2-10 depend from Claim 1.

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VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether Claims 1-10 are unpatentable under 35 U.S.C. § 103(a) over European Patent Application No. 1 202 365, with inventors Yamaguchi et al., in view of U.S. Patent No. 6716553, issued to Fujita et al.

VII. ARGUMENT

Claims 1-10 are patentable under 35 U.S.C. § 103(a) over European Patent Application No. 1 202 365, with inventors Yamaguchi et al., in view of U.S. Patent No. 6716553, issued to Fujita et al.

A. Claim 1

Claim 1 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over European Patent Application No. 1 202 365 ("Yamaguchi et al.") in view of U.S. Patent No. 6716553 ("Fujita et al."). See final Office Action mailed August 26, 2009.

The objective of the invention of Claim 1 is to provide an electrolyte membrane having excellent 1) inhibition of permeation of water and organic solvents with 2) little reduction in surface area and 3) high proton conductivity. Paragraph 7. Claim 1 defines subject matter that achieves this objective, and it is asserted that the combined teachings of the cited references fail to render obvious the invention of Claim 1 for the reasons described below.

Claim 1 achieves the noted objective by providing an electrolyte membrane that includes a porous substrate having pores filled with a first polymer having proton conductivity, thereby to impart proton conductivity to the electrolyte membrane. The porous substrate is comprised of i) a second polymer which is at least one selected from the group of polyolefins, and ii) a third polymer having a carbon-carbon double bond. The porous substrate also includes a crosslinked second polymer wherein the second polymers are crosslinked with one another. The electrolyte membrane of Claim 1 has a proton conductivity of 0.05 S/cm or more and a membrane area change ratio of 20% or less.

KSR confirmed that the Graham Factor Analysis should be used in determining whether a claimed invention is obvious under 35 U.S.C. § 103(a). *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct.

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1727, 1739 (2007). The Graham framework is based on the following underlying factual inquiries (*Id.*):

(a) ascertaining the scope and content of the prior art;

(b) ascertaining the differences between the claimed invention and the prior art; and

(c) resolving a level of ordinary skill in the pertinent art.

The results of these factual inquiries then form the basis upon which the question of obviousness is answered.

It is well accepted that the USPTO bears the burden of establishing a case of *prima facie* obviousness. The legal concept of *prima facie* obviousness allocates who has the burden of going forward with production of evidence in each step of the examination process See *In re Rinehart*, 531 F.2d 1048, 189 U.S.P.Q. 143 (C.C.P.A. 1976). The Patent Office bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR* noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. M.P.E.P. § 2143.

The Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 U.S.P.Q.2d 1385, 1395-97 (2007) identified a number of rationales to support a conclusion of obviousness which are consistent with the proper "functional approach" to the determination of obviousness as laid down in *Graham*. One rationale to support a conclusion that the claim would have been obvious is that all the claimed elements were known in the prior art and one skilled in the art could have combined the elements as claimed by known methods with no change in their respective functions, and the combination yielded nothing more than predictable results to one of ordinary skill in the art. *KSR*, 550 U.S. at ___, 82 U.S.P.Q.2d at 1395; *Sakraida v. AG Pro, Inc.*, 425 U.S. 273, 282, 189 U.S.P.Q. 449, 453 (1976); *Anderson's-Black Rock, Inc. v. Pavement*

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Salvage Co., 396 U.S. 57, 62-63, 163 U.S.P.Q. 673, 675 (1969); *Great Atlantic & P. Tea Co. v. Supermarket Equipment Corp.*, 340 U.S. 147, 152, 87 U.S.P.Q. 303, 306 (1950). "[I]t can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." *KSR*, 550 U.S. at ___, 82 U.S.P.Q.2d at 1396.

The Examiner appears to have found Claim 1 obvious based on a rationale of combining prior art elements according to known methods to yield predictable results. To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Then, Office personnel must articulate the following (M.P.E.P. § 2143(A):

(1) a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference;

(2) a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that in combination, each element merely performs the same function as it does separately;

(3) a finding that one of ordinary skill in the art would have recognized that the results of the combination were predictable; and

(4) whatever additional findings based on the *Graham* factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

If any of these findings cannot be made, then this rationale cannot be used to support a conclusion that the claim would have been obvious to one of ordinary skill in the art.

Appellants assert that the Office has not established a *prima facie* case of obviousness because the cited references fail to teach, suggest, or otherwise make obvious each and every

limitation of Claim 1; and the Examiner has failed to show proper motivation to modify the teachings of the Yamaguchi et al. reference and the Fujita et al. reference to arrive at Claim 1.

1. Scope and Content of Prior Art

a. Yamaguchi et al.

Yamaguchi et al. teaches an electrolyte membrane for use in a fuel cell that comprises a substrate comprising a heat-resistant porous material that does not swell substantially with water and organic solvents such as methanol. ¶ [0017]. The porous materials include inorganic materials such as glass, ceramics, and silica; and organic materials such as Teflon® and polyimide. ¶ [0017]. One or more of the porous materials can be used to form the substrate. ¶ [0017]. A proton-conductive polymer is formed in the pores of the porous material to provide proton conductivity to the substrate. ¶¶ [0019]-[0026].

b. Fujita et al.

Fujita et al. teaches a porous film for use as a separator in batteries and capacitors comprising a polymer composition comprising (a) a polymer having a C=C double bond and an aliphatic ring having 5 to 10 carbon atoms in the main chain thereof; and (b) another resin. Abstract. The C=C double bond in the (a) polymer is "disappeared" (i.e., crosslinked) by heat treatment so as to provide heat resistance to the film. Col. 6, lines 16-22. The resin can be a polyolefin. Col. 4, lines 22-46.

2. The Differences Between the Cited References and the Rejected Claims Are Not Obvious Differences

In the context of an obviousness rejection, the Supreme Court explained the importance of "identify[ing] a reason" why a skilled artisan would be prompted to arrive at the presently claimed invention. *KSR Int'l Co. v. Teleflex, Inc.*, 127 S. Ct. 1727, 1741 (2007). The Court noted that there should be an "explicit" analysis regarding "whether there was **an apparent**

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reason to combine the known elements **in the fashion claimed** by the patent at issue." *Id.* (emphasis added). As will be explained, the references do not teach every limitation of Claim 1 and there is no apparent reason to modify or combine any of the cited references in the manner suggested by the Examiner or otherwise to arrive at the presently claimed invention.

a. The Cited References Fail to Teach, Suggest, or Otherwise Make Obvious Each and Every Limitation of Claim 1

The combined teachings of Yamaguchi et al. and Fujita et al. fail to teach, suggest, or otherwise make obvious each element of Claim 1 for several reasons. First, the references do not teach the recited proton conductivity and membrane area change ratio of the invention. Second, Fujita et al. has been misinterpreted and does do not teach a second polymer crosslinked with itself. Third, Yamaguchi et al. has been misinterpreted and does not teach a porous substrate comprised of a second polymer which is a polyolefin.

i. The Combined References Do Not Teach the Proton Conductivity and Membrane Area Change Ratio Elements Recited in Claim 1

Yamaguchi et al. does not disclose the recited characteristics of Claim 1 with regard to an electrolyte membrane proton conductivity of 0.05 S/cm or more and membrane area change ratio of 20% or less. Fujita et al. does not remedy the deficiencies of Yamaguchi et al., and thus, the combined teachings of the cited references do not render Claim 1 obvious.

In finally rejecting Claim 1, the properties of proton conductivity and membrane area change ratio are asserted by the Office to be inherent in an electrolyte membrane resulting from the combined references in absence of unexpected results. *In re Spada* (911 F.2d 705, 709, 15 U.S.P.Q.2d 1655, 1658 (Fed. Cir. 1990)), was cited in the final rejection for the proposition that products of identical chemical composition cannot have mutually exclusive properties.

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A proton conductivity of 0.05 S/cm or more and a membrane area change ratio of 20% or less are not inherent features of the membrane resulting from the combined teachings of the cited references for the following reasons.

According to the M.P.E.P. § 2112, "the express, implicit, and inherent disclosures of the prior art reference may be relied upon in the rejection of claims under 35 U.S.C. §§ 102 or 103." Additionally, in defining the doctrine of inherency, § 2112 states that "there is no requirement that a person of ordinary skill in the art would have recognized the inherent disclosure at the time of the invention, but only that the subject matter is in fact inherent in the prior art reference."

However, § 2112(iv) states that "the fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic." And, inherency "may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." M.P.E.P. § 2112, citing *In re Robertson*, 49 U.S.P.Q.2d 1949, 1950-1951 (Fed. Cir. 1999) (emphasis added). Additionally, "in relying on the theory of inherency, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." (M.P.E.P. § 2112(iv), citing *Ex parte Levy*, 17 U.S.P.Q.2d 1461,1464 (Bd. Pat. App. & Int. 1990)) (emphasis in original).

It is the Examiner's burden to positively show how every aspect of Claim 1 is taught by the cited prior art, or to provide evidence and reasoning as to why any aspects of Claim 1 that are not taught by the prior art are necessarily inherent.

It is asserted that the Examiner has not met the burden required by the M.P.E.P. to prove the proton conductivity and membrane area change ratio of Claim 1 are inherent properties of the teachings of the cited references. The Examiner concludes the combined references teach the

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electrolyte membrane of Claim 1, and thus, asserts the prior art membrane inherently has the properties of the claimed membrane. The Examiner's conclusion is improper for the following reasons.

The recited proton conductivity of 0.05 S/cm or more and a membrane area change ratio of 20% or less are not inherent properties of the membranes taught by the cited references because (as explained in more detail in the next subsection) the combined cited references do not teach several elements of Claim 1, including the use of a proton-conducting polymer within a porous substrate comprising a polyolefin that is crosslinked with itself and a polymer having a carbon-carbon double bond. Because the cited references do not teach all elements of Claim 1, it is improper to conclude that an electrolytic membrane resulting from the combined teachings of the cited references would inherently possess the same proton conductivity and membrane area change ratio as the membrane of Claim 1.

Furthermore, as shown by FIGURE 1 of the application, the claimed proton conductivity and membrane area change ratio do not <u>necessarily</u> flow from the combined teachings of the cited references. FIGURE 1 illustrates the proton conductivity and membrane area change ratio for an embodiment of Claim 1 (see B-3). FIGURE 1 also presents comparative examples B-C1 to B-C4. The differences between these comparative examples and that of exemplary membrane B-3 will now be described. B-C1, B-C2, and B-C3 include a PTFE membrane instead of the polyethylene (i.e., a polyolefin) of B-3. These three comparative examples are within the teachings of Yamaguchi et al., which teaches the use of PTFE as a membrane material (see ¶ [0017] of Yamaguchi et al.). B-C4 includes a Nafion 117 proton-conductive material instead of the ATBS proton-conductive material of B-3. Comparative example B-C4 is not within the teaching of Yamaguchi et al. because a polyethylene substrate is used in B-C4 and the reference only teaches PTFE and polyimide (organic) substrates. B-C4 is presented as a comparative

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example because a known proton-conductive material, Nafion 117, is used instead of the novel proton conductive material, ATBS, used in B-3. Comparative examples B-C1 through B-C3 illustrate proton conductivity and membrane area change ratio values for known prior art materials (as would be characterized from the combined teachings of the cited references, particularly Yamaguchi et al.). As can be seen from FIGURE 1 of the application, the proton conductivity and membrane area change ratio for B-3 is not the same as the proton conductivity and membrane area change ratio of comparative examples B-C1 through B-C3, which represent prior art membranes because they use PTFE as the membrane material. These results contradict the conclusion that the proton conductivity and membrane area change ratio of the electrolyte membrane of Claim 1 are inherent in view of the combined teachings of Yamaguchi et al. and Fujita et al.

For these reasons, the claimed proton conductivity and membrane area change ratio are not inherent in view of the combined teachings of Yamaguchi et al. and Fujita et al., and therefore, *prima facie* obviousness has not been established.

ii. Fujita et al. Has Been Misinterpreted and the Combined References Do Not Teach a Second Polymer That Is a Polyolefin Crosslinked With Itself

Claim 1 recites a porous substrate that includes a second polymer (i.e., a polyolefin) that is crosslinked amongst itself, a characteristic neither taught nor suggested by the combined references. The final rejection asserts that Fujita et al. teaches a porous substrate that comprises a crosslinked second polymer wherein the second polymers are crosslinked with one another (page 3 of November 26, 2008, Examiner's Action); however, according to Fujita et al., the polymers that are crosslinked with themselves are not polyolefins.

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Fujita et al. teaches a porous film comprising (a) a polymer including C=C double bonds that is crosslinked (Col. 3, lines 26-31 and Col. 6, lines 7-22); and (b) a resin, such as a polyolefin-based resin, that is not taught as being crosslinked with itself (Col. 4, lines 22-26). Thus, Fujita et al. teaches a polymer that is crosslinked, but is not a polyolefin; and a resin that is a polyolefin, but is not crosslinked with itself. Thus, Fujita et al. does not teach, suggest, or otherwise make obvious a porous film that includes a polyolefin crosslinked with itself.

Conversely, Claim 1 recites a substrate comprising a second polymer that is a polyolefin crosslinked with itself. For the reasons described above, Fujita et al. does not teach or suggest the crosslinked polyolefin recited in Claim 1.

As acknowledged in the Examiner's Action mailed November 26, 2008, at page 3, Yamaguchi et al. does not disclose a porous substrate wherein the second polymers are crosslinked among themselves. Thus, Yamaguchi et al. does not cure the cited deficiencies of Fujita et al. with regard to teaching polyolefins crosslinked with itself, as in Claim 1.

Because the cited references fail to teach or suggest a second polymer that is a polyolefin crosslinked with itself, each and every element of Claim 1 is not taught or suggested by the cited references, and therefore, *prima facie* obviousness has not been established and the outstanding rejections should be reversed.

iii. Yamaguchi et al. Has Been Misinterpreted and Does Not Teach a Polyolefin

The rejection of Claim 1 in view of Yamaguchi et al. states that the recited limitation that the second polymer of the porous substrate is a polyolefin is taught by Yamaguchi et al. at paragraph [0017]. Paragraph [0017] of Yamaguchi et al. discloses Teflon® as a porous substrate material. For the reasons explained below, Teflon® is not a polyolefin as recited in Claim 1, and

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thus, Yamaguchi et al. does not teach this element of Claim 1, and the Examiner has erroneously relied relying on the reference as teaching the polyolefin of Claim 1.

Teflon® is a polytetrafluoroethylene (PTFE). Polyolefins are polymers derived from simple alkenes such as ethylene or propylene. See, e.g., Malcolm P. Stevens, *Polymer Chemistry: An Introduction*, 3rd ed., p. 16, Oxford University Press, 1999. The present specification at paragraph [0032] lists polyethylene, polypropylene, polybutylene, 4-methylpentene, and the like as examples of polyolefins. None of polyolefins described in the present specification include any fluorinated compounds. Teflon® is entirely fluorinated, which results in its properties being distinct from polyolefins, particularly with regard to hydrophobicity, processability, and end uses. Furthermore, Yamaguchi et al. does not teach a crosslinked polyolefin, as in Claim 1, a deficiency that is not cured by Fujita et al. (as described above).

Because the Yamaguchi et al. reference fails to teach or suggest a polyolefin, as relied on by the Examiner in rejecting Claim 1, it is asserted that *prima facie* obviousness has not been established, and the rejection is untenable.

b. The Examiner Has Failed to Show Proper Motivation to Modify the Teachings of the Yamaguchi et al. Reference and the Fujita et al. Reference to Arrive at the Claimed Invention

In the context of an obviousness rejection, the Supreme Court explained the importance of identifying a reason why a skilled artisan would be prompted to arrive at the claimed invention. *KSR* at 1741. The Court noted that there should be an "explicit" analysis regarding "whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue." *Id.* As will be explained, the record is lacking any apparent reason to

modify or combine the cited references in the manner suggested by the Examiner, or otherwise, to arrive at the invention of Claim 1.

The Examiner believes that one of skill in the art would be motivated to modify Yamaguchi et al. by substituting the second and third polymer of Yamaguchi et al. with the crosslinked second polymer and third polymer with a carbon-carbon double bond of Fujita et al. to arrive at Claim 1 because doing so would provide excellent heat resistance to the porous substrate of Yamaguchi et al.

Regarding the motivation of one of skill in the art to combine the teachings of the cited references, the characterization of the porous substrate of Yamaguchi et al. in paragraph [0017] should be reiterated: the substrate is heat resistant and does not swell substantially with water and organic solvents such as methanol. With these two guiding principles in mind, one of skill in the art would not combine the polyolefin-based resins of Fujita et al. with the electrolytic membrane of Yamaguchi et al. because there is no motivation to combine the teachings of the cited references. The Examiner believes that one of skill in the art would combine the references to provide a heat resistant material (Fujita et al.) for the substrate of Yamaguchi et al. However, this reasoning ignores the second requirement for a substrate material of Yamaguchi et al.: that it does not swell substantially with water and organic solvents. Fujita et al. is silent with regard to the swelling of the taught materials in water and organic solvents and so the properties of the polymers of Fujita et al. are unknown with regard to swelling. Therefore, one of skill in the art would not be motivated to combine the polymers of Fujita et al. with the substrate of Yamaguchi et al. due to the unknown characteristics of Fujita et al. with regard to the required property of swelling in water and organic solvents.

Additionally, one of skill in the art would not be motivated to combine the references because the polymers of Fujita et al. are intended for a different end use than in substrates such as

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those of Yamaguchi et al. Specifically, the membrane of Fujita et al. is taught for use as a separator for a battery with high "porosity, air permeability and puncture strength, and is especially excellent in latent heat resistance or heat resistance." See Abstract (emphasis added). Thus, the materials of Fujita et al. are intended for a different end application (battery separator) than those of Yamaguchi et al. (fuel cells).

The different end uses for the materials taught by each reference are such that one of skill in the art would not be motivated to use the materials of Fujita et al. in the membranes of Yamaguchi et al. As described above, the fuel cell membrane of Yamaguchi et al. requires a substrate that is <u>heat resistant</u> and <u>does not swell substantially with water and organic solvents such as methanol. Conversely, Fujita et al. teaches materials that are porous, air permeable, and puncture and heat resistant, for use as a battery separator.</u> One of skill in the art would have no motivation to combine the <u>battery separator</u> materials of Fujita et al. with the fuel cell membrane of Yamaguchi et al. because the end uses of the materials taught by the references are divergent (e.g., the battery separator must be air permeable and the fuel cell membrane cannot swell in certain solvents) and there is no indication that materials that produce improved battery separators will also produce improved fuel cell membranes.

Because one of skill in the art would have no apparent reason to modify or combine the references in the manner suggested by the Examiner to arrive at the claimed invention, as set forth above, Claim 1 is not obvious and the rejection is untenable.

B. <u>Claims 2, 3, and 5-10</u>

Claims 2, 3, and 5-10 depend from Claim 1. For the reasons set forth above regarding Claim 1, Claims 2, 3, and 5-10 are nonobvious and patentable over the Yamaguchi et al. and Fujita et al. references. A decision reversing the Examiner's rejection on this ground is respectfully requested.

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C. Claim 4

Claim 4 depends from Claim 1.

For at least the reasons set forth above regarding Claim 1, Claim 4 is nonobvious and patentable over the Yamaguchi et al. and Fujita et al. references. In this regard, Claim 4 recites that the polyolefin of the second polymer recited in Claim 1 comprises polyethylene. Polyethylene is the polymer used to produce exemplary membrane B-3, which demonstrates the recited characteristics of proton conductivity and membrane area change ratio, as illustrated in FIGURE 1. As discussed above in Section A(2)(a)(i), membrane B-3 is distinct from the cited references in both composition (because the polyolefin is crosslinked) and demonstrated characteristics (proton conductivity and membrane area change ratio). Because the combined teachings of Yamaguchi et al. and Fujita et al. do not teach, suggest, or otherwise make obvious, that the second polymer of the porous substrate of Claim 1 is polyethylene, it is asserted that Claim 4 is nonobvious in view of the cited references.

In view of the above reasons set forth in this section, as well as those set forth with regard to Claim 1, it is asserted that Claim 4 nonobvious and patentable over the Yamaguchi et al. and Fujita et al. references. A decision reversing the Examiner's rejection on this ground is respectfully requested.

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VIII. CLAIMS APPENDIX

1. An electrolyte membrane comprising a porous substrate, wherein pores of the porous substrate are filled with a first polymer having proton conductivity, thereby to impart proton conductivity to said electrolyte membrane, and the porous substrate is comprised of i) a second polymer which is at least one selected from the group of polyolefins, and ii) a third polymer having a carbon-carbon double bond in the molecule of the third polymer, and the porous substrate comprises a crosslinked second polymer wherein the second polymers are crosslinked with one another, and wherein the electrolyte membrane has a proton conductivity of 0.05 S/cm or more and a membrane area change ratio of 20% or less.

2. The electrolyte membrane according to claim 1, wherein said third polymer is at least one of polymers having an alicyclic skeleton structure and polybutadiene.

3. The electrolyte membrane according to claim 1, wherein said third polymer is polynorbornene.

4. The electrolyte membrane according to claim 1, wherein said second polymer comprises polyethylene.

5. The electrolyte membrane according to claim 1, wherein said second polymer is polyethylene and said third polymer is polynorbornene.

6. The electrolyte membrane according to claim 1, wherein one end of said first polymer is bound to surface of pores of said porous substrate.

7. The electrolyte membrane according to claim 1, wherein pores of the porous substrate are further filled with fourth polymer having proton conductivity.

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8. A fuel cell comprising said electrolyte membrane according to claim 1.

9. A solid polymer fuel cell comprising said electrolyte membrane according to claim 1.

10. A direct methanol solid polymer fuel cell comprising said electrolyte membrane according to claim 1.

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IX. EVIDENCE APPENDIX

None.

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X. RELATED PROCEEDINGS APPENDIX

None.

Respectfully submitted,

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